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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/075,802	02/14/2002	Ernst Klotz	P02,0037	8763

26574	7590	09/08/2005

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EXAMINER
LAVIN, CHRISTOPHER L

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 09/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/075,802	KLOTZ ET AL.
	Examiner	Art Unit	
	Christopher L. Lavin	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 February 2002*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *05/07/02*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

U.S. Patent and Trademark Office

PTOL-326 (Rev. 1-04)   Office Action Summary   Part of Paper No./Mail Date 082405

DETAILED ACTION

Claim Rejections - 35 USC § 112

1.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2.   Claim 14 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "approximately" in claim 14 is a relative term which renders the claim indefinite. The term "approximately" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The examiner is unable to determine what range, approximately 100 falls into. Is 110 approximately 115 or how about 150? Thus the examiner will interpret this claim for the remainder of the action as simply requiring that there is some range for the histogram.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4.   The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.
2.   Ascertaining the differences between the prior art and the claims at issue.
3.   Resolving the level of ordinary skill in the pertinent art.
4.   Considering objective evidence present in the application indicating obviousness or nonobviousness.

5.   This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6.   Claims 1 – 5, 11, and 15 – 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uppaluri (6,466,687) in view of Heuscher (5,396,418).

In regards to claim 1, A method for processing a computed tomography image comprising the steps of: obtaining a computed tomography image of a lung of a subject [with contrast agent administered to the subject so as to affect said image], said image being comprised of pixels respectively having gray scale values associated therewith (col. 4, lines 13 – 22); determining pixels representing pulmonary parenchyma in said image, as pulmonary parenchyma pixels (col. 4, lines 36 – 43; col. 18, lines 6 – 18); and generating a processed image by presenting said pulmonary parenchyma pixels in false colors and presenting remaining pixels in said image in said gray scale values (col. 20,

lines 8 – 17; col. 21, 52 – 65: By overlaying the colored image onto the gray scale image Uppaluri is accomplishing this step.).

Uppaluri is silent on the issue of contrast agents. However it is well known in the art as shown by Heuscher (col. 7, lines 50 – 62) to use a contrast agent with a CT system to bring out vessels in the image.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use a contrast agent (as taught by Heuscher) in the method disclosed by Uppaluri. By using a contrast agent blood vessels will be brought out in the image which will let Uppaluri more easily identify the blood vessels. This will simplify the classification process.

In regards to claim 2, A method as claimed in claim 1 wherein the step of determining the pulmonary parenchyma pixels comprises applying a contour finding algorithm to said image and thereby separating said pulmonary parenchyma pixels from said remaining pixels (col. 4, lines 36 – 63).

In regards to claim 3, A method as claimed in claim 1 wherein each of said pixels in said image has an HU value associated therewith, and comprising determining said pulmonary parenchyma pixels, together with pixels representing bronchia and vessels, based on said HU values, and removing said pixels representing bronchia and vessels from said pulmonary parenchyma pixels (col. 18, lines 5 – 18; col. 21, line 66 – col. 22, line 10: CT images are measured using HU values. The grey scale images represent HU values in the image. The image areas are classified based on the grey scale values.).

In regards to claim 4, A method as claimed in claim 3 wherein said pulmonary parenchyma pixels and said pixels representing bronchia and vessels comprise a totality of pixels, and comprising removing only a portion of said totality of pixels which does not exceed a predetermined maximum percentage of said totality of pixels (col. 21, 66 – col. 22, 10: As classification groups can be removed from the image, amongst those groups is broncho-vascular, the bronchia and vessels can be removed. As only the pixels labeled as broncho-vascular are removed only a portion of the total pixels are removed, with the maximum number of pixels being the number of pixels which are labeled broncho-vascular.).

In regards to claim 5, A method as claimed in claim 4 comprising classifying the removed pixels as invalid pixels (col. 18, lines 5 – 18; col. 21, line 66 – col. 22, line 10: By classifying the pixels as broncho-vascular is the same as classifying them as invalid pixels.).

In regards to claim 11, A method as claimed in claim 5 comprising superimposing said pulmonary parenchyma pixels presented in false colors on said pixels presented in gray scale values, and replacing any pixels classified as invalid with corresponding pixels of said image in gray scale values (col. 21, line 66 – col. 22, line 10; col. 21, 52 – 65: Uppaluri discloses that the color image can be overlaid onto the gray scale image. Uppaluri also teaches that parts of the color image can be removed. However Uppaluri never explicitly teaches that both operations can be performed together. It would have been obvious to one having ordinary skill in the art to combine these two operations. Thus when the invalid pixels are removed the gray scale image below would be seen.

Allowing the user to combine functions will allow the user to get a better understanding of the image and possibly allow the user to better diagnose the patient.).

In regards to claim 15, A method as claimed in claim 1 comprising obtaining a plurality of computed tomography images of said lung comprising, in combination, volume data from said subject, and for each of said images in said plurality of images, determining said pulmonary parenchyma pixels and generating a processed image wherein the pulmonary parenchyma pixels are presented in false colors and wherein the remaining image regions are presented in said gray scale values (col. 4, lines 23 – 28).

In regards to claim 16, A method as claimed in claim 15 comprising conducting a multi-planar image reconstruction of said volume data comprised of said plurality of images (col. 4, lines 23 – 28; col. 22, lines 55 – 62: Uppaluri states that the method can be performed on a set of images which are combined into one 3D image.).

In regards to claim 17, Uppaluri discloses processing a CT image to bring out the pulmonary parenchyma. However Uppaluri does not disclose subtracting a contrast agent-enhanced image from a none contrast agent-enhanced image.

Heuscher discloses subtracting a reference CT image which does not use a contrast agent from a contrast agent enhanced CT image in order to better detect blood vessels.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to perform a subtraction operation between an enhanced CT image and a reference CT image. By performing this operation blood vessels can be better displayed for a physician to diagnose the lungs.

In regards to claim 18, claim 18 is rejected for the same reasons as claim 1. The argument similar to that presented above for claim 1 is applicable to claim 18. Claim 18 distinguishes from claim 1 in that it lists system parts. These parts are seen in Figure 13 of Uppaluri. The image input device is a scanner.

In regards to claim 19, claim 19 is rejected for the same reasons as claim 17. The argument analogous to that presented above for claim 17 is applicable to claim 19.

In regards to claim 20, A computed tomography apparatus as claimed in claim 18 comprising a user interface, including said display, connected to said processor, said user interface having an actuatable operating element for implementing the determination of pixels representing pulmonary parenchyma in said image and the display of said processed image (Figure 14 is an example of the user interface.).

In regards to claims 21 – 23, claims 21 – 23 are rejected for the same reasons as claims 18 – 20. The argument analogous to that presented above for claims 18 – 20 is applicable to claims 21 – 23.

7.   Claims 6 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uppaluri as modified by Heuscher as applied to claim 5 above, and further in view of Wood (5,351,305).

In regards to claim 6, Uppaluri (as modified by Heuscher) does not disclose a smoothing operation on the pulmonary parenchyma. Uppaluri does teach of classifying tissue and thus performing an operation on only some of those classified groups would have been obvious.

Wood discloses (col. 3, line 65 – col. 4, line 19) performing a smoothing operation on a CT image using a smoothing filter.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to perform a smoothing operation (as taught by Wood) on the pulmonary parenchyma identified by Uppaluri. Smoothing operations remove noise. By removing noise the user will not be confused by small random noise dots when performing a diagnosis.

In regards to claim 7, A method as claimed in claim 6 comprising conducting a sliding averaging of said pixels in said region containing said pulmonary parenchyma pixels as said smoothing operation (Wood: col. 3, line 65 – col. 4, line 19: A sliding average is what Wood performs. A filter moves over blocks of 11x11 pixels performing a smoothing. This is a sliding average.).

In regards to claim 8, A method as claimed in claim 6 comprising selecting only a plurality of pixels, from among said pixels in said region containing said pulmonary parenchyma pixels, for smoothing in said smoothing operation (Wood: col. 3, line 65 – col. 4, line 19: An 11x11 pixel block is away of selecting only a plurality of pixels.).

In regards to claim 9, A method as claimed in claim 8 comprising identifying a middle pixel in said plurality of pixels selected for said smoothing operation, and conducting said smoothing operation by generating an average value of said plurality of pixels selected for said smoothing operation, referenced to said middle pixel (Wood: col. 3, line 65 – col. 4, line 19).

In regards to claim 10, A method as claimed in claim 9 comprising designating a minimum proportion of valid pixels among said plurality of pixels selected for said smoothing operation, and setting said middle pixel to an invalid status if said minimum proportion is not reached (Wood: col. 3, line 65 – col. 4, line 19: Any smoothing filter which is moved across an image area will eventually reach an edge of the image area. At some point, most likely when the middle pixel is past the edge it will be marked invalid and the rest of pixels under the filter will not be smoothed.).

8.   Claims 12 – 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uppaluri as modified by Heuscher as applied to claim 1 above, and further in view of Krauss (5,253,281).

In regards to claim 12,Uppaluri teaches (col. 6, lines 34 – 42) that a histogram can be used to window the parenchyma pixels. However Uppaluri does not disclose performing a windowing operation on the gray scale. However Uppaluri teaches (col. 21, lines 2 – 5) that the contrast can be changed on the gray scale image.

Krauss teaches (col. 1, lines 43 – 47) that a gray scale x-ray image can be windowed to display the full brightness range.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to perform windowing (as taught by Krauss) on the gray scale portion of the image in the method disclosed by Uppaluri. Performing this adjustment will allow the gray scale image to fully utilize the range of gray scales, thus brining out more detail for the physician to see.

In regards to claim 13, A method as claimed in claim 12 comprising windowing the pulmonary parenchyma pixels presented in false colors dependent on a histogram of said pulmonary parenchyma pixels (col. 6, lines 34 – 42).

In regards to claim 14, A method as claimed in claim 13 wherein said histogram has a center of gravity, and employing said center of gravity as a central value in said windowing of said pulmonary parenchyma pixels, and setting a width of a window in said windowing of said pulmonary parenchyma pixels to a fixed value of approximately 100 HU (col. 6, line 35 – col. 7, line 68: Every histogram relies on finding a "center of gravity" and pixels that fall within a certain distance of this center to identify regions.).
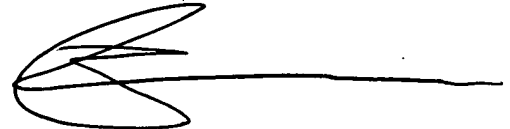
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher L. Lavin whose telephone number is 571-272-7392. The examiner can normally be reached on M - F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mancuso Joseph can be reached on (571) 272-7695. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christopher Lavin

BRIAN WERNER
PRIMARY EXAMINER